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FAD assisted fishing practice of Kerala: A review

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Abstract
Padal fishing in backwaters of Kerala and Kolachel Fishery operating particularly for squids in marine waters are the known FAD assisted fishing practice of Kerala. It creates an artificial habitat for the feeding and breeding of fishes. The adult fishes aggregating around the FADs lay eggs underneath the FAD and thus the fishery mainly comprising the juveniles. It reduces the fish population drastically. And hence the non selective Kolachal fishing practice is now banned in Karnataka and a modified form of Padal fishing is practiced as a fish sanctuary, which can replenish the lost fish stock.

Keywords: Indigenous fishing methods, FAD assisted Fishery, Conservation

1. Introduction
The fish capture from the wild mainly depends on the understanding of the behavioral pattern of fish and ecological conditions of living habitat and topography. Using the knowledge acquired from the nature, traditional fisherman have developed many indigenous fishing gears (Plamoottil and Win, 2017) [14]. These indigenous fishing practices are characterized by the conventional wisdom of traditional fishermen and long term practice of fishing (Sahadevan, 2016) [8]. Use of Fish Aggregating Devices (FADs) to attract fishes are increasingly common through out the world (Guillotreau *et al*., 2011) [8]. The thigmotropism in fish are being used in these type of fishing activities (Uddin *et al*., 2015) [27].
The aggregating behaviour of fish species around the floating object have been used by the fishermen globally. Fish Aggregating Devices are the tool to improve the fish production in marine and inshore waters by attracting fishes. Under the high fishing pressure in marine waters, FAD offers an alternative fishing opportunity to the fishermen. The behaviour of aggregation around the floating structure was reported for the first time in 200 AD in Mediterranean (Dagorn *et al.*, 2013) [2]. The information on aggregated biomass can get from the buoy equipped with echo-sounder (Moreno *et al*, 2016) [12]. The major hypotheses used to define the aggregating nature of fish around FAD are sheltering, meeting point. Feeding, resting, and treating it as indication of area of high production Ii. FAD Assisted Fishing Practices of Kerala.

1.1 Padal Fishing of Ashtamudi Lake
Ashtamudi lake is second largest estuary in the south west coast of India shaped palm with set of eight lakes is known for the fishing in Padals (Raghunathan, *et al*, 2007) [15]. Padal fishing of Kerala is a type of FAD assisted fishing practice where the padals acts as a Fish Aggregating Device (FAD) that provides shelter and food to the fish which stimulate aggregating behaviour of fish (van Dam et al., 2002) [28]. Around 400 padals were operating in Ashtamudi lake even after it is banned by the State Department (Thomas and Kurup, 2004) [26]. The padals are deployed in water for almost an year and are harvested once a month.

2. Kolachal Fishery
A similar fishing method operated by the migrant fishermen from Tamil Nadu can be seen in Malabar area of the state is locally known as *Kolachal*. The fishermen migrates from Colachel and Kanyakumari to Blangad village of Thrissur district and makes an FAD, locally called as *Norumb*, with Kolanjl (Coconut Spadix) nylon ropes, pieces of webbing, plastic bottles and heavy sand bags. The plant material like Coconut fronds placed at 0.3m interval on long rope constitute the main body of the aggregating device (Sasikumar, *et al*. 2015) [20].

Fig 1: Loading of Kolachel (Source: Sreekumar *et al*., 2019)

Cash nut tree branches are used by the fishermen of Malabar region in Kerala as an aggregating device. The twigs of cashew trees are placed in rivers and lakes to attract the fish like pearl spot. The fishes feeding on peryphyton are being attracted to the area and that area acts as breeding ground and hiding place for many of other species.

The methods similar to padal fishing of Kerala can also be seen in various parts of India which includes the *kampagudu* of Andhra Pradesh, *Byana* fishing of West Bengal and *Katal* fishing of Assam (Sharma, *et al*, 2015) [23]. Similar fishing practices named *jhag, katta and jhata* are found in Bengladesh (Wahab and Kibria, 1994) [30]. *Samrah* is the FAD assisted fishery of Cambodia (Shankar *et al*., 1998) [22] and *athukotu* is operating in Srilanka.(Senanayake, 1981) [21].

2.1 Fishing Method

Padals are aggregates of branches of trees like mango and cashew which are placed in the lake. This will induce plankton bloom and thus creates an artificial environment that attracts fish to spawn. They are usually built during pre monsoon period and are placed in the bed. Phytoplankton are developed from the submerged padal which are utilized by the fingerlings and post larvae. Various commercially important species like *Etroplus suratensis, Penaeus indicus ,Chanos chanos, Liza parsia and Mugil cephalus* are being caught using this padals (Thomas and Kurup, 2004) [26]. Harvesting of fish are during the lunar period of every month and may take more than a day. The number of days for harvesting depends on the size of the padal and the number of persons engaged in the activity. To prevent the fish from escaping, nylon net are encircled on bamboo poles erected around the padal. Then the padals are removed and fishes are caught using a scoop net or a cast net (Thomas and Kurup, 2004) [26].

In *Kolachil* fishing of Malabar region, the fishing operations are similar to the Pedal fishing where the spadix of the coconut tree is used to form structures that attract fishes (Vimalraj, *et al*, 2014). Screw pine leaves are also dumped in the water to attract the cuttlefishes (Sasikumar et al., 2015) [20]. Huge rocks and sand bags are being used in order to anchor the long ropes which holds the spikes or *kolachil*. These are left without any indicators and pose as a big threat for trawling operations by damaging the gears (Kaladharan, *et al*, 2012) [9]. There have been reports on usage of non biodegradable materials as FADs in Malabar region (Sasikumar, 2013) [19] to avid the long term threat to the environment.

2.2 Aggregation of Fishes

The fish aggregating devices are structures which are used to attract fish and form an aggregate (Rajeshwari, 2009) [16]. Use of fish aggregating devices to lure fish has been practiced in different parts of the world for several centuries. *Acadja* fisheries of West African Lagoons (Welcomme, 1972; Devi, *et al*, 2013) [31, 4], *Longphongtook* practiced by Nocte tribe of Arunachal Pradesh (Dutta, *et al*, 2019), *Samarahs'* of Cambodia (van Dam, *et al*, 2002) [28]. *Katha* and *Komar* practiced in Bangladesh (Ghulam, and Ahmed, 2005) are some of the fish aggregating devices used across the world.

Padals act as a fish aggregating device. Fish aggregating device are deployed for attracting and aggregating the fish, which can increase the rate of catch. It also lowers the cost of production (Raju, *et al*, 2016) [17]. This method is relatively simple .Since locally available materials are the requirement of this method, it require comparatively low investment .Padals decrease operational cost of fishing craft by reducing the scouting time for fish .Thus it improves fishing efficiency and catchability.

The periphyton blooming over the coconut front acts as good food for the cuttle fish attracts the cuttle fish towards spadix of coconut in Kolachil Fishery (Sahadevan, 2016) [8]. Decaying leaves creates suitable environment for the female to breed (Sasikumar et al., 2015) [20]. Large quantity of Cuttle fish eggs on HDPE net cones used in the fabrication of Fish Aggregating Devices (FAD) congregates.

2.3 Impact of Padal fishing

It is one of the most destructive fishing method due to the extent of destruction caused to juvenile populations of commercially important fish such as etroplus and mullet (Suresh, 2000; Thomas and Kurup, 2004) [26]. The catch from padal mainly comprises of broodstock and juveniles. The aggregating fishes around the FADs are vulnerable to over explotation, increased predator pressure over lower trophic fish species and also it alters the fish migration route (Kingsford, 1999) [10]. Thus over the years, padal fishing has reduced the piscine population drastically. The structure accelerates sedimentation threatening the balance of the inland ecosystem. Completely Submerged padals also pose a threat to the navigation system. This is why this practice is banned.

It has been shown that the depleting mangrove cover has a serious impact on the fish population. Therefore a modified form of padal fishing has been introduced to rejuvenate the the fish stock. This new initiation is called Matsysthavalams - which means fish sanctuaries. The padals are fixed in the bed and bamboo poles are erected around it. These are declared as no fishing zones and the entry to these zones are prohibited. Various studies shows that these sanctuaries has flourished and nurtured the fish stock in the area. Since bamboo fencing is done around the padals, dangers it pose to the navigation system is avoided.

The use of non degradable materials like HDPE cones in the construction of Fish Aggregating Devices pollutes the marine ecosystem and can cause entangling of aquatic organisms or ghost fishing (Sasikumar *et al*., 2015) [20].

FAD attracts the non targeted fishes during purse seining (Hunter and Mitchell 1967) and the release of FADs in large numbers changes the natural environment of tunas (Moreno *et al*,, 2016) [12]. Thus purse seine operation around drifting Fish Aggregating Device causes deleterious impact to the ecosystem viz., reduction in yield per recruit of targeted fishery, alteration to the movement pattern of resources, increased bycatch and imbalanced ecosystem ((Fonteneau *et al*. 2000; Bromhead *et al*. 2003; Morgan 2011) [6, 1, 13].

3. Conclusion

It is clear that padal fishing is a destructive fishing practice. Excessive use of padals have decreased the fish population drastically because of the extent of destruction caused to juveniles. If the juveniles are allowed to reach marketable size with judicious exploitation by statutory gears, it would replenish the stock of the estuary (Kurup and Thomas, 2001) [11]. This is why the government decided to ban it. But even now ,more than hundred of padals can be found in Ashtamudi and Vembanad lake .Kerala state fisheries department is removing these padals with the help of fisherman who are willing to follow sustainable practices.

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